ERIC Document Resume	See Instruction Sheet	DATE OF RESUME 7/14/65	DATE RECEIVED

A. PUBLICATION DATA

1. ERIC NUMBER	2. ORIGINATOR CONTROL NO(S).	3. IDENTIFICATION NO.	DO NOT WRITE IN SPACE BELOW
ED000331	7063	N.A.	

4. AUTHOR(S):
Kimball, Wm. P.

5. TITLE OF DOCUMENT ABSTRACTED:
Dartmouth's Engineering Programs: Environmental Engineering

6. PUBLICATION TITLE:
N.A.

7. EDITOR(S):
N.A.

8. PLACE OF ORIGIN
Dartmouth College
ORG.
Hanover, New Hampshire
ST.
CITY, STATE

9. PUBLISHER OR SOURCE
Dartmouth College

10. VOL.	11. PAGES	12. MO./YR.	13. TOTAL PP.
N.A.	N.A.	60	8

TELE. EXT.
INST/LOC CODE

MICROFILM COPY AVAILABLE
YES ☒ NO ☐

COPYRIGHT GRANTED
YES ☐ NO ☒

COPYRIGHT RELEASE FILED
YES ☐ NO ☐

TYPE OF REPORT
PROPOSAL ☐
IN-PROGRESS ☐
FINAL ☒
FOLLOW-UP ☐

OTHER ERIC REFERENCES:

ERIC SATELLITE CODE

B. INDEXING DATA

14. SUBJECT AREA

15. TYPE OF ENDEAVOR
report

16. INDEXING TERMS (6-12)

planning P-15		engineering edu. G-14		
curriculum R-53		undergraduate edu. Y-33		
professional edu.	P-20	graduate edu. S-04		

17. ABSTRACT (MAX. 250 WORDS)

Proposal to apply new environmental engineering concept to the reshaping of civil engineering curriculum. Cites reasons for selecting civil engineering curriculum and discusses three-stage operation consisting of pre-professional education, professional study, and graduate studies.

C No.

18. SOURCE OF ABSTRACT

C. FUNDING DATA

19. SUPPORTING ORGANIZATION	20. DIVISION OR DEPT.	21. CONTRACT NO. / PROJECT NO.
	22. TOTAL COST OF PROJECT	
	23. DURATION OR PROJECT	U.S. Department of Health, Education, and Welfare Office of Education

C Form 1

IV-5, Engineering

May 26, 1960

"Dartmouth's Engineering Program
Environmental Engineering
Supplementary Notes,"
by William P. Kimball.

Environmental engineering is not a new branch of engineering distinct from the traditional branches. It is, rather, a new concept which might be applied to some of the activities of any of the traditional branches. My present proposal is to apply this concept to the reshaping of the civil engineering curriculum at Dartmouth. This curriculum is to replace the present civil engineering curriculum. It can be presented in parallel with whatever other engineering curricula may be included in Dartmouth's program.

The reasons for selecting civil engineering, apart from my personal preference for work in that field, are

1) The concept is particularly applicable to some of the technologies which have long been identified as civil engineering, such as water resources, waste disposal, transportation, housing, land use and urban development.

2) Civil engineering has less opportunity to grow in stature and importance to society through its technologies alone than do some of the other branches. A new concept which will enable the profession to grow by the breadth and environmental importance of its contribution is therefore needed.

3) To the extent that civil engineering has limited its vision to the empirical technologies of the past, it has lost ground in the eyes of the public and it has lost its appeal to bright young men contemplating professional careers. A new concept such as environmental engineering is needed to re-establish civil engineering in a role of importance in society and as one of the leading curricula in the programs of engineering schools.

4) In his preoccupation with the design of components rather than with the planning of overall systems, the civil engineer has all-too-frequently permitted himself to become the technician for the architect or the politician or the non-technical planner. His education should prepare him to envision, conceive and lead rather than to follow in a subordinate position.

5) The opportunities and the effectiveness of building the professional courses on the prerequisite courses in mathematics and the physical and engineering sciences are more limited in civil engineering than in electrical and mechanical engineering. The civil engineering curriculum therefore has greater need to draw on other aspects of the pre-professional studies.

6) Thayer School's long and distinguished record in civil engineering education makes it especially appropriate for Dartmouth to establish a curriculum which will keep it in the forefront of education for this engineering discipline.

My proposal, therefore, is to develop an engineering curriculum in the adaptation of man's environment* to his needs, uses and benefit in such fields as

*I am using the word environment in its broadest sense to include the social, economic, political, and cultural as well as the physical conditions in which man lives and works.

Dartmouth IV- 5 (Engineering)

U. S. DEPARTMENT OF HEALTH, EDUCATION AND WELFARE
Office of Education
This document has been reproduced exactly as received from the person or organization originating it. Points of view or opinions stated do not necessarily represent official Office of Education position or policy.

ED000331

water resources, waste disposal, transportation, housing, land use and urban development. I am sure we will want to develop the fields of water resources, waste disposal, and transportation.

The opportunities in housing, land use and urban development, as well as in other possible fields, need further study. For example, an important new activity which will soon be established in Hanover is the work of the Army Engineers' Cold Regions Research and Engineering Laboratory. It seems probable that this activity and the environmental engineering program will have mutual interests which will lead to useful cooperative efforts.

I conceive Dartmouth's part in the education for environmental engineering to be chiefly in the first two stages of a three-stage operation consisting of pre-professional education, professional study and graduate studies.

The pre-professional stage at Dartmouth will consist of the four-year undergraduate engineering science curriculum which is the foundation on which all Thayer School's postgraduate work is built. Minor adjustments to focus on the environmental engineering objective may be found desirable.

The professional stage will consist of a year of postgraduate study at Thayer School which will relate the undergraduate studies to the civil engineering fields selected to development and including water resources, waste disposal, and transportation. This is the most critical stage of our program and the one where the greatest originality and educational pioneering will be needed. The application of the social science and humanities studies, as well as of the science and mathematics prerequisites, to engineering problems will be the important opportunity and challenge of the environmental engineering curriculum.

By this effort, the social sciences and humanities, which are widely regarded as a necessary element in the education of the engineer, can actually be brought into the engineering courses themselves just as mathematics and the physical sciences are now carried forward.

The third stage will give the student the opportunity to study in depth and at the graduate level one of the specialty fields included in his professional study at Thayer School. This stage is not considered essential for all students, but, rather, desirable for some. It can probably be performed more successfully in the larger university graduate schools and is therefore not included in the present proposal for Thayer School.

With respect to the courses to be developed for the year of postgraduate professional study at Thayer School, it appears to me that this must be a truly interdepartmental undertaking. It will be up to us at Thayer School to provide the leadership and coordination as well as to teach the technology. But we cannot develop the courses alone and, I suspect, we should not teach them alone either. We must have the active participation of individuals in the social science departments, and perhaps in some of the humanities departments, as well as in the mathematics, physical, life, and engineering science departments.

It is apparent that in order to introduce the broader concepts of environmental engineering into the curriculum it will be necessary to abbreviate or eliminate some of the present curriculum content. It is proposed to accomplish this by limiting the range of civil engineering technology traditionally required

of the student. One of the most acute problems in civil engineering education has been created by the extreme breadth of subject matter included--from waste disposal to structural design and from harbor development to photogrammetry, for example. It now becomes necessary to accept as a civil engineer a man educated and experienced in <u>any</u> of these areas rather than in <u>all</u> of them. This realistic view of civil engineering makes possible the environmental approach and the "systems" concept.

It is interesting to note the drastic revisions of the civil engineering curriculum recently announced by MIT. Although it is clear that our methods will be different, it is interesting to see how parallel our pathways to the future appear to be. A statement of the MIT objectives is attached.

The statements which I have made publicly and to individuals and groups have been extremely general and have not attempted to define environmental engineering precisely or to describe in any detail the educational process which is proposed. Nevertheless, many gratifying responses have been received. Excerpts from a few of the written responses are attached to this report.

5/26/60
WPK

Attachments

Massachusetts Institute of Technology

CIVIL AND SANITARY ENGINEERING

"There are trends that point the way to the future. Among these are the rapid tempo of scientific and technological advance, the explosion of population, and the rate of which we are plundering our natural resources. Closely associated is the rate at which man seems to be poisoning - and in some instances strangling - the environment in which he lives. Radioactive wastes, water shortages, smog, obsolescent structures, and traffic congestion may all be cited as among the problems that must be faced - and faced by civil engineers. Such problems have two common denominators: they all deal with human needs on a large scale; and they all deal with man's environment. Civil Engineering at M.I.T. centers on the fulfillment of human needs through the adaptation and control of the land-water-air environment.

"Since it deals with man as well as with his environment, civil engineering is based not only on the physical sciences - as are all the branches of engineering - but on the earth, life, and social sciences as well. Building from these roots, the civil engineer is concerned with the engineering of the structures, ground facilities, and processes that comprise and control environment. But today he must go beyond this: to truly serve man's needs, these components must be integrated into systems such as those involved in water resources and transportation - systems that involve social as well as physical forces.

"Modern technology - which in part has led to some of our great environmental problems - also provides powerful tools to cope with solutions to these problems. Civil Engineering at M.I.T., in bringing these tools to bear, is the instigator of significant change in the engineering of man's environment. As such, it is of particular interest to young men who are not only challenged by the intellectural rigor of science and mathematics, but who at the same time are motivated to exploit the frontiers of science and technology for the direct benefit of people on a large-scale basis."

COMMENTS

S. R. Stearns, Professor of Civil Engineering, Thayer School:

"This new program in Environmental Engineering answers so well the questions, in the minds of staff and students, about the future of Civil Engineering. It removes the barriers to our planning, and the confusion in our thinking, for it becomes a primary objective rather than a secondary one.

"In a memorandum to the CE faculty, dated October 17, 1958, I stated these objectives for a CE program:

> "To prepare the graduate to meet the general requirements of technology, present and future.
>
> "To meet the particular technical and social requirements of Civil Engineering.
>
> "To provide the special skills, required of Civil Engineers to evaluate a situation, or problem, for not only its technical content, but also for its economic and social consequences.

"Also in this memorandum, I reported my complete agreement with the points stressed by Professor Eliassen during his visit as a consultant, namely:

> "1. The C.E., more than other engineers, must deal with people develop public works, and blend scientific training with economic and social factors. Judgment, based on a training in the arts and humanities, as well as the sciences, is essential.
>
> "2. The C.E. must synthesize. The problems, or projects, he encounters must be attacked with a blend of training, both theoretical and practical. The better a. C.E. can apply the laws of nature to the situation at hand, while meeting the economic and aesthetic demands of society, and while utilizing the developed techniques of design and construction, the better he will advance his profession and benefit society.

"I felt then, as I do now, that the C.E. cannot, then, concentrate on basic science or on engineering science alone. Nor can the training of a C.E. be restricted to extension, or application, of that part of engineering science which is most highly theoretical.

"On May 28, 1959, at a meeting of the CE faculty, it was emphasized that more elective courses in the liberal arts would be of great value, and attractive, to the pre-engineer in Civil Engineering. We stated that the branch program must be modern and farsighted. It must be founded on, and capitalize on, these particular characteristics of civil engineers: awareness of social and economic influences, judgment, opportunity for self employment and individual responsibility, and close relationship with the public."

Comments

John C. Woodhouse, Atomic Energy Division, DuPont, Overseer of Thayer School:

"I think that you have hit on something which should have been apparent to many people concerned with current scientific and engineering programs but something I'll confess I had not thought about. I think also that your description of it as environmental engineering is very apt. The field does include very critical problems as atmospheric pollution and nuclear waste disposal that are crying for solution but have not been getting it from those who are creating the problems. Again I feel you have hit the mark in stressing that as with engineering science, Dartmouth can and should be a pioneer and under your leadership make very important contributions."

....

"Just this week I saw a restatement by the Chief Scientist of the Air Force of what Gordon Brown has stressed - that 'engineering' appears to be losing to 'science' its appeal to young men and that heroic steps will have to be taken to change the situation. What you propose strikes me as such a step."

J. Hartness Beardsley, President, Twin Falls Power Corporation, Ltd., Overseer, Thayer School:

"Now that I am very closely identified with the field of Civil Engineering I can certainly give testimony that there are plenty of essential problems that are not well solved and that must have our best brains and energy applied to them. I still feel strongly that at Thayer School, we would be well advised to orient what specific studies we must toward important fields that are natural to us, where there isn't necessarily tremendous competition from other established institutions, and where there is a need for our product. This orientation may be toward certain interests in Polar Studies, it may well be leading the way in a new concept of Environmental Engineering - a modernizing of the present concept of Civil Engineering where the educational methods and the approach from the point of view of the young and eager student may have to be drastically revised, reorganized, modernized.

"Your thinking of closer correlation and cooperation between Engineering and the Social Sciences is long over due if it can be only worked out on a practical working basis. It is entirely consistent with the Dartmouth Philosophy of Education, and should work better there than anywhere else I can imagine.

"I predict that your thinking is so sound that given half a chance, your proposed curriculum can be as much sought after and as much in demand by Dartmouth men as any up there for boys with interest in getting into scientifically oriented work."

J. E. McKee, Professor of Sanitary Engineering, California Institute of Technology:

"Needless to say, I heartily approve of your action and welcome you to the select circle of engineers and scientists interested in all of mankind's problems in relation to his environment. As you know, we are working partly along the same lines at Caltech, although our program is called 'Environmental Health Engineering'.

"We all wish you the best of success in your new endeavor. You will find it to be extremely stimulating and it will give you many new contacts. I hope that you will devote a substantial portion of the time to environmental factors that are related to health. In this connection, perhaps I can be of some assistance to you through my contacts with the U. S. Public Health Service."

Dartmouth College News Service
Hanover, N.H. Phone: 30, ext. 255, 286
George O'Connell, Director
DIA1234

April 18, 1960

FOR IMMEDIATE RELEASE

HANOVER, N.H. -- The Thayer School of Engineering at Dartmouth College will soon inaugurate a new concept of engineering education, President John Sloan Dickey announced today.

The new approach, based on the adaptation of man's environment to his needs, uses and benefit, is called "environmental engineering." It was approved by the Board of Trustees at a meeting on April 15.

The program will be directed by Dean William P. Kimball, who proposed it. To carry out the project, Dean Kimball has asked to be relieved of his duties as dean and chairman of the Engineering Sciences Department, but he will continue to carry these responsibilities until a successor is named.

Dean Kimball said that the concept of environmental engineering requires a command of the relevant technology and an understanding of the social, economic, political, cultural and physical conditions within which man lives and works.

However, he said, "since the scope of the technology that can contribute to environmental engineering is too broad for any one individual to master, the practicing engineer will concentrate on a sector of technology consistent with his particular interests and aptitudes. Examples are water resources, waste disposal, transportation, housing, land use and urban development."

The proposed new program of environmental engineering will include three stages, preprofessional undergraduate study; postgraduate study

- more -

relating undergraduate work to engineering technologies; and the possibility of further graduate work at other institutions in a specialty such as water resources and the other examples above.

Although educators generally accept the view that engineering education should include the humanities and social sciences, the proposed Dartmouth program will be among the first to use the social sciences background in engineering courses, Dean Kimball said.

Thus, just as principles learned in physics and mathematics courses are now related to engineering studies at Dartmouth, so will the principles of the social sciences be applied in class work. Dean Kimball said the new program is expected to provide opportunities of cooperation not only with departments of the social sciences, but also with the new Cold Regions Research and Engineering Laboratory the U.S. Army Corps of Engineers is building in Hanover.

President Dickey praised the new plan and expressed appreciation to Dean Kimball "for all that you propose to do . . . as a teacher-scholar to keep engineering education here at Dartmouth worthy of its great tradition and responsive to the drastically altered demands and opportunities that are now facing us."

- end -